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Bureau of Entomology and Plant Quarantine

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THE MORE IMPORTANT FOREST INSECTS IN 1951 - A SUMMARY

Prepared by the Division of Forest Insect Investigations

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This report on the more important forest insects in the United States in 1951 is the summation of information obtained from surveys and miscellaneous reports from nine field stations of the Division of Forest Insect Investigations, located in the various forest regions of the country, and from other Divisions of the Bureau of Entomology and Plant Quarantine. As in 1950, this information has been compiled from surveys on federal lands administered by the Forest Service of the Department of Agriculture, and by the National Park Service, Bureau of Indian Affairs, Bureau of Land Management, and Fish and Wildlife Service of the Department of the Interior, and from information obtained through the cooperative efforts of state entomological and forestry agencies and a large number of private timberland owners and operators. This summary would not have been possible without this excellent cooperation.

As a result of these surveys control operations have been recommended and successfully carried out in various parts of the country. The results of these operations are treated briefly in the discussion of the insect involved. In addition these surveys have disclosed declines in populations in time to make possible the cancellation of proposed control projects.

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This is the second annual summary of the forest insect situation in the United States since the passage of the Forest Pest Act in 1947. Three years of effort under the provisions of this Act have seen the development of forest insect surveys in the Division of Forest Insect Investigations into a closely knit organization whereby more intensive surveys are possible than ever before. During the winter season survey schools were held for the western stations at Fort Collins, Colo., and for the eastern stations at New Haven, Conn. At these schools problems common to the regions were discussed and a closer integration of the work has been made possible. Considerable time was also spent in developing improved sampling techniques and a clearer approach to statistical analyses of the data obtained. This has resulted in more accurate surveys and sounder control recommendations than heretofore. In addition a great deal of attention has been paid to cooperative training schools in various parts of the country. Through these schools men from the forestry agencies and the timberland industries have been given a working knowledge of the insects which may do damage in their respective regions. In the initial detection phases, particularly, the information from all these cooperators may result in the location of potentially serious infestations and make possible early control measures.

During the past year a plan for conducting forest insect surveys, determining the need for control, and giving technical assistance and advice in actual control operations has been prepared. While it is intended primarily for use by the Divisional personnel it will also be found useful by all cooperators. The end product will be the technical reports from the respective field stations, summarizing all available information regarding the conditions in each Region.

Control work on the spruce budworm in Oregon and Washington and on the Engelmann spruce beetle in Colorado was again conducted on a very ambitious scale. Two radically different types of control work were carried out in these programs: (1) the dispersion of DDT in concentrated form from airplanes to control a defoliator, and (2) the use of bark-penetrating chemicals to kill bark beetle broods and prevent further dispersal. These projects have been highly successful.

ENGELMANN SPRUCE BEETLE (Dendroctonus engelmanni Hopk.) The Engelmann spruce beetle outbreak in Colorado declined very materially in 1951. As a result of the control program, initiated and carried out on the Arapaho, Routt, and White River National Forests in the spring of 1950 by the Forest Service and the Bureau of Entomology and Plant Quarantine, together with natural control factors, particularly low winter temperatures and woodpeckers, the severity of the epidemic has been greatly reduced. Abnormally low temperatures early in February occurred on the western slopes of the Rockies; temperatures as low as -49°F. and -56°F. were recorded in Kremmling and Eagle respectively. This cold wave caused extremely heavy larval mortality in many thousands of the trees infested in 1950 and forced the woodpeckers to concentrate most of their feeding in the spring at the bases of the trees where the larvae had been protected by the snow cover. As a consequence a reduced program was feasible. Although it did not get under way until late in August the 1951 control program was successfully carried out, approximately 200,000 trees being treated by the time snowstorms and cold weather prevented further work.

The fall surveys by the Bureau of Entomology and Plant Quarantine indicated that the infestation is now confined to a smaller total acreage than in 1949 or 1950 and has not moved beyond areas previously infested. The survey findings show that approximately 400,000 trees should be treated in 1952. It is expected that such a control program will reduce the infestation to an endemic level whereby maintenance control work should be sufficient to prevent new "build-ups." Local outbreaks on the Rio Grande and San Juan National Forests in southwestern Colorado have caused some timber losses, but a limited amount of control work has been sufficient to check the infestation.

There are two known areas of severe infestation on the Flathead National Forest, Mont. In one of these, the Canyon Creek Drainage, one-third of the spruce stand has been killed and an additional third was infested in 1951. Surveys indicated approximately 15,000 trees were infested. There were local outbreaks on the Dixie and Fishlake National Forests in southern Utah and on the Payette National Forest in southwestern Idaho. These were brought under control in the fall of 1950 by the application of orthodichlorobenzene-fuel oil sprays to infested trees and stumps. Woodpeckers aided greatly by destroying most of the broods in trees that were not treated.

SOUTHERN PINE BEETLE (Dendroctonus frontalis Zimm.) The southern pine beetle outbreak in the loblolly pine stands in Liberty and Hardin Counties, east Texas, declined sharply in 1951. A very intensive salvage-control program was initiated by the timber operators and there is no question that these intensive methods have been instrumental in bringing about the control of the epidemic. These salvage operations, instituted through the efforts of the Texas Forest Service and the Bureau of Entomology and Plant Quarantine, deserve special commendation. In 1950 32,000,000 board feet of sawtimber were killed, of which 20,000,000 feet were salvaged. In addition 4,000 cords of pulpwood were salvaged. A greater volume of tree mortality was expected in 1951 and salvage efforts were planned on a greatly expanded scale. As a result, of 55,000,000 board feet of sawtimber killed, 45,000,000 feet were salvaged, and of 50,000 cords of pulpwood killed, 36,000 cords were salvaged. Parasites, predators, and disease have also been important factors in the decline of the infestation, which has been almost complete despite weather conditions - drought and high temperatures - which are considered unusually favorable for development of bettle populations. Fall surveys indicated only one area where the beetles were active, and in December further depletion of beetle populations was very evident. No new attacks were noticed in any area and only a few trees were seen in which the red-top foliage indicated attack since August, 1951.

The infestation on the Croatan Ranger District of the Pisgah-Croatan National Forest in eastern North Carolina continued in severity early in the season. Approximately 4,600 acres of loblolly, pond, and longleaf pines on this district and adjoining lands owned by pulpwood and other smaller private interests were affected. Salvage operations removed about 200,000 board feet of infested timber from the National Forest. In July it appeared that the infestation was declining and a fall survey showed that only a few infested trees were present throughout the entire area. Control measures, suggested early in the season, were cancelled. Late in December damage by this bark beetle was reported from Lancaster County, S. C. Surveys in pitch pine stands in the Great Smoky Mountains National Park indicated that the southern pine beetle in this area was at a very low ebb and control work was not necessary.

MOUNTAIN PINE BEETLE (Dendroctonus monticolae Hopk.) During the last two seasons there has been a marked increase in tree mortality in the mature western white pine stands in northern Idaho as a result of attacks by the mountain pine beetle. These stands are on Federal, state, and private lands on or adjacent to the St. Joe and Clearwater National Forests. On the 107,800 acres currently infested tree mortality in 1951 averaged 2.1 percent of the pine stand compared to 1.7 percent in 1950. In a few instances the tree mortality in 1951 amounted to 5 percent of the stand. Serious losses also occurred in white pine stands on the Coeur d'Alene National Forest. Outbreaks in lodgepole pine stands on the Kootenai and Cabinet National Forests in Montana have been reduced as a result of cooperative control measures in 1949 and 1950 so that only 7,450 trees on 12,000 acres were infested in 1951. Plans are being made to treat the remaining infested trees in these stands in 1952 and 1953. Infestations in lodgepole pine stands covering 10,000 acres on the St. Joe National Forest, Idaho and on 7,500 acres on the Beaverhead National Forest, Mont., continued although they subsided somewhat in 1951. Infestations in ponderosa pine stands on the Lewis and Clark National Forest, Mont., were noticeably reduced in size from that previously reported.

One of the high lights in 1951 was the completion of the so-called Targhee-Teton control project in lodgepole pine stands on the Targhee, Teton, Caribou and Bridger National Forests and in the Grand Teton National Park in southeastern Idaho and northwestern Wyoming. It now appears that the infestation has been reduced to an endemic level and no further control work will be needed in the immediate future. The outbreak in the extensive lodgepole pine stands on the Wasatch and Ashley National Forests in eastern Utah, reported in 1950, was checked by natural factors. In certain areas many trees were infested in 1951 but most of the new attacks were relatively weak.

Several thousand ponderosa pine trees have been killed by this bark beetle on the Boise and Payette National Forests in southwestern Idaho within the past 2 or 3 years. The western pine beetle is also killing ponderosa pine in these stands; both species may be found in the same tree, but they also attack trees independently. In general, the mountain pine beetle attacks the younger and faster growing trees, whereas the western pine beetle takes out the older trees. Needlecast disease, caused by Elytroderma deformans (Weir) Darker, is very prevalent in these stands but its exact relationship to attacks by the two bark beetles is not fully understood. Small localized infestations were found in lodgepole pine stands on the Cache National Forest in northern Utah and on the Sawtooth and Minidoka Forests in southern Idaho. Control operations in these areas are planned for the spring of 1952.

This bark beetle occurred in outbreak proportions in several areas in California in 1951 and caused serious damage to both sugar pine and ponderosa pine. The most severe infestation occurred in second-growth sugar pine stands in the central Sierra region, and to a lesser degree in younger sugar pine stands in the northern part of the state. An outbreak which developed in 1950 in second-growth ponderosa pine along the east shore of Lake Tahoe now seems to be static in nature and did not increase in severity in 1951. The current outbreaks in the second-growth stands in California tend to focus attention to a gradual shift in importance of insect problems from virgin to cut-over conditions as cutting operations proceed at an accelerated pace.

The aggressive epidemic in lodgepole pine in the Wanoga Butte area on the Bend Ranger District of the Deschutes National Forest, Oregon, is confined to about 20,000 acres but poses a real threat to the extensive lodgepole pine stands in Deschutes, Lake, and Klamath Counties. Surveys in 1951 indicated that although there were approximately 38,000 infested trees in the Wanoga Butte area the outbreak seems to have subsided considerably, especially in the areas where 4,100 infested trees were removed in 1951. There were no significant concentrations southward in the Pistol Butte area. While the Deschutes epidemic was of the most concern the mountain pine beetle was locally epidemic in stands of lodgepole and white pines in many other spots in the Oregon and Washington Cascades and in non-commercial lodgepole stands and second-growth ponderosa pine stands in the Blue Mountains. All told 147 centers of mountain pine beetle infestations covering 260,000 acres were recorded in Oregon and Washington in the 1951 survey. No direct control measures appear warranted in these areas, other than in Crater Lake and Mount Rainier National Parks where a small amount of maintenance control work is desirable to protect recreational values.

WESTERN PINE BEETLE (Dendroctonus brevicomis Lec.) A complete reversal of the trend of loss caused by this major tree-killing insect occurred during 1951 as heavy infestations developed in ponderosa pine stands in northern California and subsided in the ponderosa and Coulter pine forests in the central and southern portions of the State. The over-all rate of loss caused by the western pine beetle is now at the highest level since 1941 throughout northern California. Local outbreaks occurring over most of the 500,000 acres of commercial virgin pine stands in the northeastern part of the State are causing depletion at the current rate of 150 board feet per acre.

Reports from foresters throughout the ponderosa pine region of Oregon and Washington indicate a flare-up similar to that in northern California. For the first time since 1941, group killing was evident in many forests. The 1951 survey revealed that rather serious losses of ponderosa pine, mostly on the better sites, were occurring in Oregon principally on the Warm Springs Indian Reservation, the Chewaucan area on the Fremont National Forest, stands on the Malheur National Forest previously cut by a 40 percent Economic Selection system of marking, and on portions of the Deschutes National Forest. The survey showed a total of 65 centers of epidemic infestation covering 303,000 acres. Where possible salvage operations should be started so as to remove the infested groups while the trees are still merchantable as well as to prevent the spread of the beetles during 1952. No direct control is necessary at present.

As noted in the discussion on the mountain pine beetle a considerable amount of ponderosa pine on the Boise and Payette National Forests in southwestern Idaho is being attacked by the two species. Much of this infestation is in trees weakened by the needlecast disease. The Forest Service treated 2,247 beetle-infested trees on the Boise Forest in the spring of 1951, about half of which were infested by the western pine beetle. Fall surveys indicated approximately 880 new attacks, but about half of these were adjacent to an area which was treated in 1951. These trees will be treated in the spring of 1952 in an effort to prevent excessive losses prior to completion of roads which will make logging possible. There are several other areas on the Boise and Payette Forests where the needlecast disease is prevalent and where beetle-infested trees are present in groups, suggesting outbreak conditions. This is undoubtedly the most serious forest insect condition in the Intermountain Region.

BLACK HILLS BEETLE (*Dendroctonus ponderosae* Hopk.) The Black Hills beetle problem in ponderosa pine stands on the Harney and Black Hills National Forests in South Dakota has been reduced to an endemic level through the recent control efforts by the Forest Service and cooperators. Annual maintenance control measures should keep the insect at that level in the future. A serious situation in 1950 on the Roosevelt National Forest was reduced markedly by low temperatures in November 1950 and February 1951. However, survival of the hibernating larvae was sufficient to maintain an epidemic condition in some areas. Consequently a control program in 1952 has been recommended in order to reduce the beetle population to an endemic level. Control programs were carried out in 1951 in ponderosa pine stands on the San Isabel, San Juan, Rio Grande, and Uncompahgre National Forests in southern Colorado with considerable success. However, fall surveys indicated numerous new attacks on all four Forests and additional control operations have been recommended for the spring and summer of 1952. Natural control factors have reduced the Black Hills beetle populations to endemic levels in ponderosa pine in the Black Forest and the Denver Mountain Parks, Colo. Reconnaissance surveys in November in the ponderosa-lodgepole pine types on the Bighorn National Forest and adjacent state and private lands in Wyoming revealed that an epidemic situation in ponderosa pine still persisted in spite of heavy larval mortality due to low temperatures in February, 1951. The over-all attack was not as aggressive as in 1950 and "pitchouts" were quite plentiful. No infested lodgepole pines were found this year in the Bighorn stands. A total of 5,030 infested ponderosa pine trees were treated on the Dixie National Forest in 1951. Of this number, 1,350 being logged and taken to sawmills where they were sawn into lumber and the slabs burned. The 1951 fall surveys indicated that 1,600 trees should be treated in 1952. Nearly half of these are in areas not treated in 1951. A small outbreak of 110 ponderosa pine on the Lake Fork Ranger District, Ashley National Forest, will be treated in the spring of 1952 to protect high watershed values.

DOUGLAS-FIR BEETLE (*Dendroctonus pseudotsugae* Hopk.) This bark beetle continued to be one of the most destructive forest insects in the northern Rocky Mountains. High endemic populations were prevalent throughout the region and in some stands the timber losses have reached epidemic proportions. The most serious situation is located on approximately 300,000 acres of private and state owned mature stands adjacent to the St. Joe and Clearwater National Forests in northern Idaho. On one 40,000 acre tract, where Douglas-fir comprises 60 percent of the stand, or about 20,000 board feet per acre, surveys showed that 9.5 percent of the fir had been killed in 1950 and 8.4 percent in 1951. Groups of as many as 200 large trees were killed in 1951. In southern Idaho and Utah groups of trees killed by this beetle were more numerous than in 1950.

The outbreak in the Douglas-fir stands on the Roosevelt National Forest and the Rocky Mountain National Park, and on private lands between, in Colorado was brought under control naturally by the extremely low temperatures in February, 1951. Localized losses in merchantable timber occurred in the southern part of Colorado and in northern New Mexico but, logging of infested trees as practiced on the San Juan and Santa Fe National Forests, is serving as an effective control measure.

Aggressive outbreaks resulted in the killing of large groups of Douglas-fir in 1951 in California for the first time. No extensive infestations had heretofore been reported in this State and it was somewhat of a surprise when the cooperative detection surveys revealed group killing in many localities. Such group killing was abundant in local areas on the west slope of the northern Sierra region and throughout the north coast Douglas-fir region. Past outbreaks have been of minor importance in California.

Extensive areas of Douglas-fir in the western part of Oregon and Washington suffered severe wind damage during the winter of 1949 and 1950 and, as expected, large Douglas-fir beetle populations developed in the windthrown and broken trees. During 1951 a tremendous volume of green standing timber was attacked by the beetles which emerged from the wind-damaged trees. Surveys showed a total of 106 centers of infestation on approximately 168,000 acres. The heaviest centers were on the Umpqua, Siuslaw, Willamette, and Gifford Pinchot National Forests and in the vicinity of Coos Bay, Ore. Salvage of the windthrown trees, as well as the weakened, red-topped, and freshly-attacked trees, should be undertaken immediately to keep the outbreak from spreading, as well as to utilize the dead timber.

TURPENTINE BEETLES (Dendroctonus valens Lec. and D. terebrans (Oliv.)). The aggressive nature of these two closely related bark beetles became even more noticeable in 1951.

The red turpentine beetle (Dendroctonus valens) was apparently responsible for the death of many Jeffrey pines in the Laguna area in southern California. Ponderosa pines on the Kaibab National Forest, Ariz., and particularly in recently cut-over areas, were attacked by this beetle in 1951. Green white pine lumber cut in the fall of 1950 in a small operation on the Biltmore Forest, N. C., and piled in the residual stand attracted this beetle in the spring of 1950 and resulted in attack of about 50 white pine trees. The infestation was checked by spraying the bases of the trees with one-half percent wettable benzene hexachloride in water.

The black turpentine beetle (Dendroctonus terebrans) has become one of the most serious forest insect pests affecting the hard pines in the south. However, damage varied so much in 1951 that it was impossible to make an accurate comparison on the over-all status with that of 1950. In Mississippi infestations appeared to be less severe, but this may have been due to a decrease in cutting operations during the summer months, particularly in the vicinity of turpentine woods. In Louisiana, however, beetle activity seemed to be greater than in 1950; one operator reported an average of 5 trees killed per acre, usually in the 16 to 18 inch diameter class, compared to 3 per acre in 1950. This same operator stated that 2,000,000 board feet of infested sawtimber and 3,000 cords of pulpwood had been removed from 20,000 acres in 1951, and at least 5,000 cords remained unsalvaged. In loblolly pine stands in east Texas it appeared that the infestation was more serious than in 1950. Abundant breeding in stumps was observed and a great many infested trees were found, particularly in stands killed by the southern pine beetle and subsequently logged. In some spots it was estimated there were as many as 15 infested, living, dying, and dead, trees per acre. Slash and longleaf pines, in the dry swale areas on the Osceola National Forest, northern Florida, were heavily infested. A control operation was begun late in the fall of 1951 and will be continued into the spring of 1952. It is expected that 10,000 trees will be logged during that period and the stumps and the basal 4 - 10 feet of the unsalvaged infested trees will be treated with benzene hexachloride in fuel oil to prevent spread of the beetles to surrounding areas. In North Carolina this insect also threatened the success of the newly formed Carolina Naval Stores Cooperative at Southern Pines and naval stores operations at Bladen Lakes State Forest. The infestations were brought under control by treating the bases of approximately 700 trees with a benzene hexachloride spray.

OTHER Dendroctonus species. A concentration of tree-killing by the Jeffrey pine beetle (Dendroctonus jeffreyi Hopk.), amounting to approximately 75 board feet per acre, occurred throughout the east side ponderosa and Jeffrey pine areas in California. A complex of this beetle and flatheaded borers killed single and scattered Jeffrey pines in local recreational areas in southern California. Elsewhere in the State this bark beetle was relatively obscure throughout the year.

The Alaska spruce beetle (Dendroctonus borealis Hopk.) continued to cause damage to Sitka spruce in Alaska. Recently 35,000,000 board feet of timber, reserved for future military use, has been killed.

Ponderosa pines on the Lincoln National Forest and the Mescalero Apache Indian Reservation in New Mexico continued to die as a result of attacks by the southwestern pine beetle (Dendroctonus barberi Hopk.), the roundheaded pine beetle (D. convexifrons Hopk.), and the Colorado pine beetle (D. approximatus Dietz.). A contributory factor to these attacks may have been the extreme drought conditions in the southwest. The southwestern pine beetle and the roundheaded pine beetle were also found attacking ponderosa pine on the Santa Fe National Forest, N.M., Here, however, the heavy losses were attributed to the prolonged drought. On the Coconino National Forest, in Arizona, extremely dry conditions have caused the death of many ponderosa pines; bark beetles were a minor contributing factor.

ENGRAVER BEETLES. The various species of engraver beetles continued to be of considerable importance in forested areas and plantations throughout the country. In most cases attacks were induced by a variety of factors including over-maturity, drought conditions, soil conditions, blowdowns, root rots, cutting operations, and attacks by other insects.

The fir engraver (Scolytus ventralis Lec.), attacking white fir, has increased in seriousness since 1950 in the Sandia ski area on the Cibola National

Forest in New Mexico. Control measures in 1950 were successful, but trees blown over during the spring of 1950 and later attacked were not treated with insecticide or removed before the broods emerged. Consequently, plans have been made to treat 2,000 trees in the spring of 1952 to prevent new attacks. This insect also has caused extensive damage to silver fir in northwestern Washington in recent years. Each year there has been an increase in this type of damage and the 1951 surveys reported a total of 129 centers on approximately 243,000 acres throughout the Washington and Oregon Cascades and the Olympic Peninsula. Salvage operations to prevent spread to other areas were recommended. In California this pest was present throughout most of the mixed conifer stands, white fir being killed in groups of small trees and in a scattering of large trees. Killing was most prevalent in the higher elevations of the eastside Sierra subregion, but also occurred in local areas in southern California.

The Oregon pine engraver (Ips oregoni Eichh.) caused extensive top-killing of mature and overmature ponderosa pine in farm wood lots in the Flathead River Valley near Kalispell, Mont. This infestation is believed to have developed in slash from recently-cleared power lines and road rights-of-way, and in wind damaged trees.

Ips calligraphus (Germ.), I. grandicollis (Eichh.), and I. avulsus (Eichh.) were common on all the hard pines in the South in 1951. The infested areas varied in size from a few to a hundred acres and were often associated with fire, lightning strikes, blowdowns, slash, or cut-over areas. The Forest Service reported that over 7,000,000 board feet of timber were killed on National Forest lands alone in the Southern Region. Since these lands represent about 5.5 percent of the commercial forest in the South, the total probable loss was over 125,000,000 board feet. The gravity of this situation becomes apparent with the knowledge that much of this timber is not salvaged because usually only 4 or 5 trees per acre are killed and it is not profitable to salvage them. Damage in the Gulf States appeared to be as serious as in the drought year of 1948. This was particularly true throughout Texas and Louisiana and was especially noticeable in the loblolly pine stands attacked by the southern pine beetle and the black turpentine beetle. In Texas death of trees, probably from attacks by I. avulsus, began with killing from the top downward and in October killing by Ips bark beetles was more common than was caused by the southern pine beetle.

Research workers at the University of Wisconsin reported that, in some localities in that state, piles of rough jack pine pulpwood infested by Ips pini (Say), I. chagnoni Sw. and I. grandicollis, served as a source for attack of standing trees nearby. Some tree mortality occurred.

Damage by Ips engravers in California pine stands was generally reduced in 1951 although some local group loss occurred in the ponderosa pine reserve stands in northern California, and in one or two of the recreational areas in the southern part of the State. Drought conditions and species of Ips have caused considerable loss of pinyon on the Santa Fe National Forest, N. M.

WEEVILS. The white-pine weevil (Pissodes strobi (Peck)) was epidemic locally throughout the Lake States in 1951. Attacks were particularly severe on jack pine; a survey of a 5-year old plantation on the Manistee National Forest, lower Michigan, for example, disclosed that 15 to 20 percent of the trees were weeviled during the season. Red pine, previously considered as not being a favored host, has been attacked in recent years in the Lake States with increasing frequency. This continued in 1951. Survey plots established to measure the annual fluctuations in populations indicate that old field white pine plantations in New York and Connecticut were heavily infested in 1951. Attacks start when the trees are 2 to 3 feet tall and the percent infestation for 1951 increased progressively from 0 to 74 percent as the height increased to 8 feet. Plots in New Jersey showed only a trace of weeviling. In general, damage to young white pine in other sections of the Northeast has not been severe, although there are few localities where white pine occurs that are free from some weevil attack. In the southern part of the range of white pine tip-killing by this insect was more abundant than in 1950. Some of the plantations in northwestern North Carolina were reported to have a total weevil attack of over 75 percent.

The Sitka-spruce weevil (Pissodes sitchensis Hopk.) has caused severe damage in planted and natural sitka spruce stands and the timberland owners and paper and pulp companies in Oregon and Washington are much concerned. Sitka spruce has been extensively planted because of its rapid growth, but attacks by this weevil are causing deformed trees and loss of increment. While the 1951 situation is somewhat improved over that of 1950, industrial foresters, in cooperation with the Division of Forest Insect Investigations, are planning studies to evaluate the degree and severity of attack before the companies decide to discontinue spruce planting.

The Engelmann spruce weevil (Pissodes engelmanni Hopk.) caused considerable local damage to Engelmann spruce along the Gallatin River, Mont., and at Cascade, Idaho.

The pales weevil (Hylobius pales (Hbst.)) killed a very high percentage of the loblolly and slash pine seedlings in a 350-acre plantation established in December 1950 and January 1951 on International Paper Company lands in Red River Parish, La. This plantation was established following a clear-cutting pine salvage operation necessitated by hailstorm damage in May 1950 and subsequent engraver beetle attacks. Salvage was begun in August and completed late in November. In May 1951 about 75 percent of the planted stock had been girdled and killed by the feeding of adult weevils. An examination in December revealed that less than 24,000 of the original 238,000 planted trees had survived - a loss of about 90 percent.

New outbreaks of the pine reproduction weevil (Cylindrocopturus eatoni Buch.) occurred in plantations of ponderosa and Jeffrey pines in two brush-field planting areas in Siskiyou and Lassen Counties, Calif. Due to heavy investments in attempts to regenerate pine in these brush-field areas, aerial applications of DDT will be undertaken in 1952 for control.

OTHER COLEOPTEROUS SPECIES. The California flatheaded borer, (Melanophila californica Van D.), is primarily responsible for the progressive weakening and killing of ponderosa and Jeffrey pines in California.

It was found in incipient form in most trees in some localities; in some cases being followed by bark beetle attacks. Tree killing resulting from flatheaded borer infestations occurred, as in 1950, throughout most of the eastside pine reserve stands, particularly in portions of Lassen and Plumas Counties.

Cone beetles (Conophthorus spp.) were numerous in local areas in California and were responsible for premature dropping of cones, thus destroying sources of seed planned for regeneration of logged areas. Activity by these insects was particularly noticeable in sugar pine and white fir cones in the northern part of the State.

The pine colaspis (Colaspis pini Barber), which girdles individual pine needles and causes entire areas to appear as if fire-swept, was quite common in 1951 in the South and appeared to be increasing in abundance. Although it causes no serious damage, DDT sprays have been used in some places to prevent heavy feeding and to maintain the best possible growing conditions for planted stock.

The pine chafer (Pachystethus oblivia (Horn), which feeds on developing needles of jack pine, was locally epidemic in central Michigan. Elsewhere it was endemic being generally less numerous than in 1950.

A local outbreak of white grubs (Phyllophaga spp.) was reported in plantings on the Raco Ranger District, Upper Michigan National Forest.

SPRUCE BUDWORM (Choristoneura fumiferana (Clem.)) This insect has been the most serious forest pest in North America for many years. In 1951 it maintained its country wide importance. Although it declined in population in some areas it increased in others. With the exception of the pine types in the South it was present in greater or less degrees of intensity in all the conifer types of the United States and Canada.

Three years of concentrated effort have greatly reduced the budworm threat to the Douglas-fir region of Oregon and Washington. In that time a total of 2,128,000 acres has been sprayed and the outbreak has been reduced from a peak of 2,276,000 acres in 1949 to 1,651,000 acres in 1951 and the area of heavy infestation has been reduced from 887,000 acres to 82,000 acres in the same period. Tree mortality has been confined to less than 10,000 acres and the control program has effectively prevented the spread of the insect in the Douglas-fir stands in Oregon and Washington. The 1951 surveys indicated the need of a control program in 1952 calling for spraying heavy and medium epidemic infestations on 281,000 acres of federal lands and 325,000 acres of state and privately owned lands.

The Maine infestation declined still further in 1951. Ground and aerial surveys, carried out in cooperation with the Maine Forest Service, disclosed fewer budworms in most of the spruce-fir type and a smaller area of noticeable defoliation (236,800 acres in 1951 compared with 4,000,000 acres in 1950). Parasites and birds caused a sharp reduction in population in the late larval and pupal stages. Consequently moths were scarce and very few egg masses were deposited. It is expected, therefore, that the budworm populations will decline still further in 1952 and that the infested area will be smaller. It now appears that the Maine infestation has declined in the same manner as the New York infestation did in 1948.

Surveys in New Hampshire, Vermont and New York, in cooperation with the entomology and forestry departments, indicated extremely light populations of the budworm with no measurable defoliation of spruce and fir. Outbreak conditions existed over an area of 2,200 square miles of spruce-fir type in the province of New Brunswick; some of this being near the Maine border. Continued high populations are indicated in 1952 and plans are being made to spray about 200,000 acres of valuable timberland presently threatened. Throughout Ontario and western Quebec infestations seem to be declining but in eastern Quebec the situation is still serious. North of the St. Lawrence River where this insect has caused considerable tree mortality there was a decrease in populations and defoliation. South of the River, including the Gaspe Peninsula, the budworm is increasing in numbers and defoliation is becoming noticeable.

The spruce budworm situation in Montana and Idaho increased in gravity in 1951. More than 1,500,000 acres of Douglas-fir type, principally in Montana, were infested. There was little change in the total acreage infested, however, since new extensions of current infestations, notably west of the Continental Divide, were balanced by declining infestations elsewhere. The heaviest tree damage in 1951 was in a belt in Montana along the eastern slope of the Divide from a point northwest of Helena to a point east of Butte. Continued northward extension into the Swan River Valley, southeast of Kalispell, will seriously jeopardize Montana's Christmas tree industry, one of the largest in the United States. Spectacular mass flights from the infested stands in the Helena National Forest occurred in August. The moths were so sumerous in the city of Helena that it was necessary to extinguish outside advertising lighting in the business section in an effort to free the section of the moths. Heavy infestations were reported on the Bitterroot, Flathead, Lolo, Helena, Deerlodge, and Gallatin National Forests and treatment, by airplane spraying, has been recommended on approximately 148,000 acres. Glacier and Yellowstone National Parks were also reported to be infested but there were no areas with sufficient populations indicated in 1952 to warrant control recommendations.

On the Boise National Forest in southwestern Idaho heavy defoliation, ranging up to 90 percent of the current season's foliage, occurred in Douglas-fir and alpine fir stands. On the Sawtooth National Forest in southern Idaho, however, there was a definite reduction in the amount of defoliation in the same timber type. One area of several thousand acres of grand fir, on privately owned land, near Lewiston, Idaho was reported to be heavily defoliated.

The infestation in Engelmann spruce and Douglas-fir stands in the North Rim and Kaibab Plateau areas of the Grand Canyon National Park and the Kaibab National Forest in northern Arizona declined in 1951. In New Mexico, particularly on the Santa Fe National Forest, the situation in the spruce and fir types remained serious. Thus far mortality of the larger trees has been of little importance; however, malformations and death of the understory trees have seriously affected the rising trade in ornamental and Christmas trees in this Region. The infestation in the Douglas-fir type on the Pike National Forest in Colorado continued to subside naturally. In California the status of the spruce budworn was unchanged, with only a limited amount of defoliation in the white fir stands in the Warner Mountains in Modoc County.

The jack-pine form of the budworm was epidemic in northern and central Michigan this year, but endemic elsewhere in the Lake States. The infestation, which in 1950 extended over approximately 1,152,000 acres of jack pine type in parts of the Huron National Forest and the Ogemaw and Higgins Lake State Forests in lower Michigan, was again active; it is estimated to have increased in area by about 20 percent. Infestations on 4,358 acres of jack pine plantations in the Rapid River Ranger District of the Hiawatha National Forest in northern Michigan were controlled by spraying. An additional 1,040 acres in this District were heavily infested in 1951 and a light infestation was observed in 2,500 acres of cutover land, supporting jack pine, on the Manistique District. Damage in the jack pine type in the Lake States appeared to be increasing. Tree mortality, which was heaviest in reproduction and 2-inch sapling classes, was already evident in the older areas of attack.

SHOOT AND TIP MOTHS. Populations of the European pine shoot moth (*Rhyacionia buoliana* (Schiff.)) remained high in red pine plantations in those portions of New York, New Jersey, and Connecticut which were heavily infested in 1950. Survey plots are being established throughout the range of this insect in the Northeast to determine annual fluctuations. These data will make possible the delineation of those sections in the region where red pine is relatively free from attack and where it may be safely planted. Attempts to control this insect over relatively large areas with present methods have not been satisfactory. A dosage of 4 pounds of DDT in 4 gallons of spray per acre, applied by helicopter, did not give good control in 71 acres of severely infested red pine plantations on the Allegheny National Forest in northwestern Pennsylvania. It has been recommended that planting of red pine should be restricted to localities where winter temperatures will be low enough to be unfavorable for survival of the hibernating larvae. Red pine plantations in southern Michigan and in Ohio were severely infested. However, larval mortality of 50 to 96 percent was reported in northern Ohio.

The Nantucket pine moth (*Rhyacionia frustrana* (Comst.)) continued to be abundant, especially in *loblolly pine plantations*, throughout the Southeast. Foresters in the Piedmont plateau and northern coastal plan area continually observe that pine reproduction is held in suppression by this insect until the less desirable hardwoods choke it out. There is no satisfactory control. At present this species is endemic in the Central States and no activity was reported in 1951. Two closely related pine tip moths, (*R. frustrana bushnelli* (Busck.)) and *R. neomexicana* (Comst.)), were still *present in ponderosa pine plantations on the Nebraska* National Forest in Nebraska. However the damage appears to be decreasing in intensity as the trees become older and increase in size.

The jack pine shoot moth, (*Eucosma sonomana* Kearf.), was widely distributed and caused noticeable *leader damage in jack* pine plantations throughout the Lake States.

HEMLOCK LOOPERS. There was a considerable increase in the infestation of a hemlock looper (Lambdina athasaria athasaria Wlkr.) in the Northeast in 1951. Hemlock stands in western Pennsylvania, totalling 1,800 acres, were heavily defoliated and in some stands tree mortality has resulted. Several hundred acres in northeastern Massachusetts were infested but there was a relatively low looper population, and control was not recommended. Individual trees in some areas of Massachusetts died. However, about 3,000,000 board feet of infested hemlock timber was salvaged. No 1951 defoliation was observed in areas in southern New Hampshire which were sprayed in 1950. No reports were received indicating a continuation of the heavy defoliation which occurred in several localities in Vermont in 1950. A localized outbreak by a closely related species (L. fiscellaria (Guen.)) was reported from the Mohican State Forest, Loundonville, Ohio.

The hemlock looper infestation that was observed in Clallam County, Wash., in 1950 was confined largely to the same general areas in 1951. Surveys recorded 27 centers of infestation totalling 4,640 acres. Tree killing is still very limited and the looper population seems to have decreased markedly. Although control measures are not deemed necessary these areas will be kept under close observation and action will be taken if the outbreak becomes aggressive.

TENT CATERPILLARS. Heavy tent caterpillar infestations were reported from all parts of the United States except the Pacific Coast region. The forest tent caterpillar (Malacosoma disstri Hbn.) was in epidemic numbers in aspen stands from North Dakota to Michigan. The most extensive infestation was present in Minnesota where surveys carried on in cooperation with the State Agencies and the Forest Service showed that 11,103,000 acres were infested. Two lesser areas, wholly distinct from the Minnesota infestation, were reported from Michigan and North Dakota. That in Michigan covers about 800,000 acres at the eastern end of the Upper Peninsula and is an extension of a tremendous area of infestation in Ontario. The North Dakota infestation is in stands near the limits of tree growth and covers about 5,500 acres. These outbreaks have been in progress for at least 3 years but, while spectacular, have not yet caused appreciable tree mortality. Control operations in 1951 were limited to about 3,000 acres, widely scattered throughout the region where special values were at stake.

During June and July, 1951, this species caused severe defoliation of aspen, cherry, sugar maple, ash, gray birch, and basswood over a widespread area in northern New York. An aerial survey by the New York Conservation Department indicated an infested area of approximately 111.000 acres, with heavy feeding on 36,000 acres centering around St. Regis Falls in Franklin County. An egg mass survey was made late in November by the New Haven, Conn. field station in cooperation with the Conservation and State Entomology Departments to determine the probability of further spread eastward into certain special use areas, such as those at Meacham Lake and Lake Titus, and to obtain some measure of the potential 1952 populations. This survey showed that egg masses were most abundant in the area most heavily defoliated in 1951. Medium to heavy egg deposition also occurred in a northeasterly direction as far as Lyon Mountain. This nearly doubles the area previously known to be infested, and includes the entire northerly slopes of the foothills of the Adirondack Mountains from points west of Potsdam eastward to Lyon Mountain. Stands of poplar and birch on the northeast side of Baxter Park, Me., covering approximately 90 square miles, were heavily defoliated by this insect.

Tupelo and black gum were subjected to heavy defoliation in Alabama and Louisiana. One timber operator in Louisiana reported, furthermore, that his lands have been infested for 10 years and that some stands are now in a state of deterioration. In southwestern Alabama about 5,000,000 acres of tupelo and black gum, oak, and hickory were attacked, with severe defoliation occurring on approximately 2,000,000 acres along the river bottoms and gum ponds.

Near Coeur d'Alene, Idaho, alder along streams suffered heavy feeding damage. In some cases, following complete defoliation of the alder and consequent shortage of food, the nearly full-grown caterpillars migrated to and caused some defoliation in nearby larch stands.

The Great Basin tent caterpillar (Malacosoma fragilis Stretch.) continued to be abundant throughout the Southwest. Cottonwood trees along streams in southern Utah were defoliated and there was considerable injury to bitterbrush and other browse plants, causing some concern to livestock and wild game interests. Effective control in Zion National Park was obtained by the application of a DDT emulsion by mist blower. The outbreak of this species in aspen stands in southern Colorado and northern New Mexico continued. The Forest Service and the town of Taos successfully sprayed 3,500 acres of aspen with DDT in heavily-used recreation areas on the Carson National Forest, N. M., and some neighboring private and municipal lands in June, 1951. These treated areas are invaded annually, hence will need respraying each spring until natural factors reduce the pest to an endemic level.

The gypsy moth (Porthetria dispar (L.)) increased materially in abundance in 1951 throughout the susceptible hardwood stands in New England and New York, except in those areas where large-scale aerial spraying operations have been conducted in recent years. Defoliation, ranging in acreage from a few to more than a thousand acres, occurred in towns near the Connecticut River between Greenfield, Mass., and Bellows Falls, Vt.; on the watersheds of the Quabbin Reservoir, central Massachusetts; near Concord, N. H.; and in southern Maine, from the New Hampshire State line east to Augusta. Defoliation occurred for the first time in the northern part of Washington County, N. Y., east of Lake George. No infestation has been found in New Jersey since 1935. In Pennsylvania, the only known infestation was in an area about five miles west of Scranton. This was discovered following the capture of eight male moths in two traps located in the township of Ransom, Lackawanna County. The infested area and adjacent territory will be sprayed in the spring of 1952.

Aerial DDT spraying of 180,000 acres of infested woodland in Connecticut Massachusetts, Vermont, and New York, in cooperation with State agencies was successfully carried out in 1951. Additional extensive acreage in these four States will be sprayed in 1952.

OTHER LEPIDOPTEROUS SPECIES. The Douglas-fir tussock moth (Hemerocampa pseudotsugata McD.) was in outbreak form on nearly 12,000 acres of second growth Douglas-fir in southwestern Idaho in 1951. Many trees were completely defoliated in July and it was feared that severe damage would result. However, a re-survey in late September revealed that nearly all the caterpillars had died before reaching maturity and new eggs were extremely scarce. Consequently control recommendations were not necessary. The jack pine tussock moth (*Olene plagiata* (Wlkr.)) was in outbreak status in jack pine stands in Douglas County, northwestern Wisconsin, over an area of more than 1,200 acres. The Wisconsin Conservation Department carried out control operations in July.

A fir looper (*Galenara* sp.) caused noticeable defoliation of valuable Douglas-fir and white fir on the Lincoln National Forest, N.M., during the spring of 1951. The infestation was discovered too late for control measures but an aerial spray project, using DDT, will be carried out on 7,100 acres in 1952.

The lodgepole needle miner (*Recurvaria milleri* Busck) caused some damage to lodgepole pine stands on the Minidoka and Targhee National Forests in southern Idaho and the fir needle miner (*Epinotia meritana* Hein.) attacked white fir stands in Bryce Canyon National Park, Utah. Spraying with DDT in 1952 in the last named area has been recommended. A virus infection of the lodgepole needle miner occurred during 1951 in stands in Yosemite National Park and at the headquarters of Kings River in California. Populations were reduced as much as 75 percent and these infestations are now considered as endemic.

The larch budworm (*Zeiraphera griseana* (Hbn.)) was found in 8 centers covering approximately 37,600 acres on the Snoqualmie and Wenatchee National Forests in Washington. Although defoliation was noticeable, mortality was confined to small trees. A tip or bud moth, believed to be *Z. ratzeburgiana* (Ratz.), caused serious defoliation of Sitka spruce in stands along the Oregon coast. Nearly 100 percent of the current growth in both natural and planted stands was attacked on many areas in 1951. This injury in combination with that caused by the spruce aphid might result in serious losses. This situation will be closely checked in 1952.

The blackheaded budworm (*Acleris variana* (Fern.)) was extensively epidemic in the hemlock forests of southeastern Alaska. While this widespread epidemic has not reached tree killing intensity, the abundance of moths in 1951 and the warm dry fall, which may have affected tree vigor, may be indicators of a serious epidemic in 1952.

The pine butterfly (*Neophasia menapia* (F.&F.)) was more abundant in 1951 than for several years. Flights were prominent in white pine stands on the Clearwater National Forest, Idaho, but no tree damage was evident. The adults were also abundant locally in ponderosa pine stands on the Boise National Forest, in southern Idaho.

The fall cankerworm (*Alsophila pometaria* (Harr.)) caused a considerable amount of defoliation of oak stands in Juniata and Perry Counties, Penn., New Haven County, Conn., and Westchester County, N.Y. It was also very abundant on aspen in 1950 in Zion National Park, southern Utah, where it was killed in tremendous numbers during the control operations against the Great Basin tent caterpillar. Only a few larvae were observed in the Park in 1951. In the vicinity of Ogden, Utah, patches of Gambel oak and Rocky Mountain maple were completely defoliated in 1950 and again in 1951.

The arborvitae leaf miner (*Argyresthia thuiella* (Pack.)) was reported to have spread a considerable distance into northern Maine.

The larch casebearer (*Coleophora laricella* (Hbn.)) was epidemic throughout most of Michigan, northern and central Wisconsin, and central Minnesota, as well as in Penobscot and Aroostock Counties, Me. In Minnesota the casebearer populations appear to be progressing northwesterly and are now beginning to encroach upon the southern limits. of extensive larch sawfly activity.

The satin moth (*Stilpnotia salicis* (L.)) caused severe defoliation of poplar and willow locally in Natick, Mass., and near Lake George, N.Y., early in June.

The fall webworm (*Hyphantria cunea* (Drury)) has been very prevalent in Connecticut and throughout New England during the past few years on a number of hosts, particularly elm and hickory. Numerous moths of the spotless variety of this insect were reported as collected from light traps maintained throughout Maine by the Entomology Department of that State.

The brown-tail moth (*Nygmia phaeorrhoea* (Donov.)) which persisted for many years on beech plum in southeastern Massachusetts has apparently been eliminated in that area following the intensive aerial spraying program against the gypsy moth. It has continued at a low ebb in the remainder of the infested territory in New England. The only outbreaks of any size in recent years were located near Lake Sebago, Me., in 1929 and in Merrimac County, N.H., in 1950. These were eliminated by spraying with DDT and no defoliation was reported in 1951 from these localities.

The variable oak leaf caterpillar (*Heterocampa manteo* (Dbldy.)) completely defoliated red oak in large areas along highways in southern Mississippi. The buck moth (Hemileuca maia (Drury)) caused heavy defoliation of live oak in southern Louisiana. The mimosa webworm (*Homadaula albizziae* (Clarke)) was reported from several localities throughout the Piedmont. Serious defoliation of mimosa and honey locust was reported from Winston-Salem and Raleigh, N. C. and Atlanta, Ga. Infestations were reported also from New Jersey and southern Pennsylvania.

SAWFLIES. As in 1950 several species of sawflies were of importance throughout the country. The outbreak of the larch sawfly (*Pristiphora erichsonii* (Htg.)), which for the last three years has been in progress whereever larch occurs in northern Minnesota, continued unabated in 1951. A systematic aerial survey failed to reveal any areas of tree mortality and preliminary analyses of the survey data suggest no great change in the extent and severity of the outbreak over that reported in 1950. In northwestern Wisconsin this sawfly is increasing in population. Endemic populations were observed in northeastern Wisconsin and as far east as Michigamme in the upper Michigan peninsula.

The red-headed pine sawfly (*Neodiprion lecontei* (Fitch)) was generally endemic in the Central and Lake States except for small, localized outbreaks on roadside plantings of jack pine and red pine. A heavy infestation occurred in red pine plantations on the Green Mountain National Forest in Vermont.

Elsewhere in the Northeast populations were at a low level. A survey of red pine plantations on the Monongahela National Forest in West Virginia revealed only a very light infestation.

The jack pine sawfly (*Neodiprion americanus banksianae* Rohw.) was endemic throughout the *Lake States except near Tawas, Mich.*, where an infestation in jack pine had increased from 100 acres in 1950 to 280 acres in 1951. The outbreak situation on 500 acres of jack pine on the Tamarac National Wildlife Refuge, in northwestern Minnesota, collapsed following cutting of overmature trees.

The European pine sawfly (*Neodiprion sertifer* (Geoff.)) was locally epidemic in central and southern *Michigan, in Ohio and in* northern Illinois. The 225-acre infestation in a mixture of pine plantations on the Henderson State Forest, Oquawka, Ill., reported in 1950 was controlled with sprays in May 1951. This sawfly also caused light to heavy defoliation of Scotch and red pines in Fairfield County, Conn., and Westchester County, N. Y., in late May. It was also abundant locally on red pine in New Jersey where an attempt was made to eliminate it by spraying with virus disease material obtained from Canada.

The hemlock sawfly (*Neodiprion tsugae* Midd.) increased noticeably in populations in 1951 in *southeastern Alaska*. While tree-killing has not been reported, the combination of sawflies feeding on old foliage and the black-headed budworm feeding on new growth is a serious one and severe tree mortality may occur in 1952.

There has been little change in the status of the Arkansas pine sawfly (*Neodiprion* sp.). Scattered throughout what was once the epidemic area in *loblolly and* shortleaf pine stands are small hot spots which are being closely watched. An increasing infestation in one of these areas was arrested when some natural factor, possibly low temperature, killed the young larvae. An area of heavy infestation, covering 1,500 acres near Urania, La., was controlled by aerial spraying with DDT three weeks after the eggs hatched. Another lightly infested area of approximately 1,200 acres, adjacent to this treated area, was discovered later in the season. Control measures may be applied in 1952 if conditions warrant such action.

Local outbreaks by species of *Neodiprion* resulted in heavy defoliation of pine and fir in central *California. Except* for the damage caused to white and red firs, used for Christmas trees, none of the outbreaks were of severe proportions. A species of *Neodiprion* was found also in two centers of infestation in lodgepole pine *stands covering* about 11,000 acres on the Klamath Indian Reservation, southern Oregon. This insect has been present on this reservation for several years and while all age classes have been severely defoliated, tree mortality has been confined to trees of the smaller diameters.

A sawfly, probably a species of *Neodiprion*, continued in outbreak proportions in pinyon at the Colorado *National Monument*. Mistblower spraying with DDT in April, 1951 resulted in excellent control in the camp ground, headquarters and roadside areas. Reinfestation from the untreated stands nearby will necessitate annual spraying, at least while populations are high.

The European spruce sawfly (Diprion hercyniae (Htg.)) was reported to be more abundant in the spruce forests in northern and eastern Maine than in previous years.

The introduced birch leaf miner (Fenusa pusilla (Klug)) was unusually abundant on gray and paper birches, particularly early in the summer, in Connecticut, Massachusetts, and eastern and northern New York. The foliage in many stands was completely mined by the first generation.

The pin oak sawfly (Caliroa lineata MacG.) skeletonized the foliage in groups of pin oak at Newton and Raleigh, N. C.

SCALE INSECTS. The black-pine leaf scale (Nuculaspis californicus (Colm.)) which has been found on many ponderosa pines dying from other causes in recent years in the Spokane area was almost completely obliterated by a late spring freeze in 1950. This insect was able to maintain a population in 1951 on only 300 acres of the 20,000 previously infested.

The beech scale (Cryptococcus fagi (Baer.)) caused widespread damage in central and northern Maine, the White Mountain region in New Hampshire, and the Catskill Mountains region in New York. In all these areas the associated fungus contributed to the damage.

The Prescott scale (Matsucoccus vexillorum Morr.) on ponderosa pine and the pinyon scale (M. acalyptus Herb.) continued in outbreak proportions in 1951 at the Grand Canyon National Park, Ariz. Virginia and short leaf pines in eastern Tennessee were reported dying early in 1951. Although a species of Matsucoccus was found on branch samples sent to the Asheville N.C. station, field examinations later in the spring did not indicate the presence of this scale or any other disturbing insect activity. The cause of death of these trees remains unknown. The Matsucoccus scale which was seriously injuring young slash pine in Florida in 1950 apparently declined in importance as no reports of flagging were received in 1951. Future reports of the presence of this insect in the South should be carefully reviewed because of the potential danger of serious damage. Surveys in red pine plantations in Connecticut and New York revealed no new areas of infestation by the Matsucoccus scale reported in 1950. This scale is still confined to the general area around East Norwich, L. I.; along the Hutchinson River Parkway in Westchester County, N. Y., and around the Hemlocks Reservoir, north of Bridgeport, Conn. For the first time all stages of the insect were found on Austrian pine. During the winter 70 percent mortality of the insect occurred in the Bridgeport area, but less than 30 percent occurred in the New York areas. Thus far all attempts to control this insect by chemical sprays have failed.

A mealybug (Puto sp.) infested Engelmann spruce on the Fishlake National Forest in southern Utah in 1950 and 1951. Although some trees have thin foliage and appear very much weakened only a few have died.

APHIDS. The balsam wooly aphid (Chermes piceae Ratz.) apparently is increasing in abundance in the Northeast. Surveys in New Hampshire revealed medium to heavy infestations in the balsam fir stands on the eastern half of the White Mountain National Forest. All infestations were of the "stem" type, no signs of "gout" being found either on the larger trees or on the reproduction. Considerable tree mortality has been reported from Maine; in some areas along the coast from 30 to 60 percent of the balsam fir is being killed and there are many areas through the eastern, central, and western parts of the State where trees are dying.

The pine leaf aphid (Pineus pinifoliae (Fitch)) was very abundant in the Northeast and in North Carolina on red spruce and white pine. This insect caused such an abundance of terminal galls on approximately 30,000 acres of red spruce type in the southern Appalachians that mountain sides in early June appeared as if burned. No damage to the red spruce was apparent later in the season; following the development of the winged generation the galls eventually dropped off. The adults from these galls flew to white pine and the resulting crawler stage caused considerable damage to the new growth on this host in local areas from Fontanna Dam, N. C. to Black Mountain, N. C. Considerable damage to the 1951 growth of white pine was also reported from northern New York, Vermont, New Hampshire, and Maine.

The spruce aphid (Aphis abietina Wlkr.) caused severe damage in the coastal spruce stands of Oregon and Washington. In some sections, it appeared doubtful whether the trees could withstand another year of attack at the 1951 intensity.

SARATOGA SPITTLEBUG (Aphrophora saratogensis (Fitch)). This spittlebug continued to cause damage in red pine plantations in Wisconsin and northern and central Michigan. A total of 6,660 acres of plantations on four national forests within this area were infested to the extent that control measures were required. An additional 5,600 acres will require spraying in 1952. This species and the closely related pine spittlebug (A. parallela (Say)) were reported as being abundant in Maine. The latter species was common to abundant on Scotch and white pines in southern New Hampshire and northcentral Massachusetts. No noticeable injury was reported.

PERIODICAL CICADA (Magicicada septendecim (L.)) Brood VIII caused considerable damage in an area of about 360 square miles in Pennsylvania east of the Ohio line and north of Pittsburg. The severe infestations seemed to follow an irregular pattern across the area, as all timberland within the general area was not damaged. Predominantly oaks were attacked, with maples, birches, and fruit orchards injured to a lesser degree. In the heaviest infestations hardly a twig on many of the oaks escaped damage.

WALKINGSTICK (Diapheromera femorata (Say)) which last appeared in outbreak numbers in 1949, was again in evidence in 1951 in Minnesota and central Wisconsin, where it has recurred during odd years for a decade or more. The populations in 1951 did not appear as numerous or as injurious as in previous years, although the results of feeding were apparent in red oak and basswood stands. An aggregate of 3,000 acres of high value hardwoods on the Menominee Indian Reservation, in Wisconsin, was sprayed to control this insect in 1951. An additional 4,000 acres, chiefly composed of hardwoods, overtopping pine, are infested in this particular area.

GRASSHOPPERS. Attempts in the past to regenerate pine on a local area of 700 acres in Siskiyou County, Calif., have been failures because of heavy grasshopper feeding on young planted pines. The populations in 1951 were severe and plantings again were failures.